In the Claims

A complete listing of all claims in this application that replaces all prior versions of the claims is set forth below.

Please amend claims 1-3, 5-8, 10-14, 16, 18-24, 27-28, 30-33, 37-39, and 41-43 as set forth below and cancel claims 4, 9, 15, 17, 25-26, 29, 34-36, 40, and 44.

1. (Currently amended) A computer system that generates a set of artificial implant model data used to fabricate an artificial implant that provides a range of motion for joints depicted in joint motion image data for a plurality of joints in a plurality of subjects ~~for designing joint artificial implant components~~ comprising:

an anthropometric data analyzer executing on a computer coupled to an interface for receiving joint motion image data representative of a plurality of joints in a plurality of subjects, and ~~analyzing~~ the received data being displayed by the anthropometric analyzer on a display to enable an operator to select points that [[to]] identify a plurality of geometric dimensions and a range of values for the identified geometric dimensions;

an implant model generator executing on a computer, ~~for receiving~~ the implant model generator receiving the identified geometric dimensions and the range of values for the identified geometric dimensions that were generated by the anthropometric data analyzer and generating a ~~and generating at least one~~ set of artificial implant model data for fabricating an artificial implant that corresponds to ~~representative of~~ the identified geometric dimensions and a group of values from the range of values for the identified geometric dimensions;

a kinematic model simulator executing on a computer, ~~for receiving~~ the kinematic model simulator incorporating the set of artificial implant model data generated by the implant model generator ~~and incorporating the received set of model data~~ in a kinematic model of a joint, ~~so that the kinematic model simulator~~ and simulating movement of the joint with the kinematic model to generate motion versus time data ~~generates dynamic response data corresponding to the set of model data whereby the dynamic response of an artificial implant corresponding to the set of model data may be evaluated~~;

a motion data analyzer executing on a computer that compares the motion versus time data generated by the kinematic model simulator with motion versus time data from the joint motion image data used to identify the geometric dimensions and the range of values for the geometric dimensions that were used to generate the set of artificial implant model data to determine whether the artificial implant corresponding to the set of artificial implant model data provides a range of motion for joints depicted in the joint motion image data; and

a database coupled to the computer executing the motion data analyzer to receive and store ~~for storing the dynamic response data~~ the set of artificial implant model data in response to the motion data analyzer determining the artificial implant corresponding to the artificial model data provides the range of motion for joints depicted in the joint motion image data.

2. (Currently amended) The computer system of claim 1 further comprising:

a dynamic response data analyzer executing on a computer that receives the motion versus time data generated by the kinematic model simulator and generates ~~to generate~~ differential dimensional data for modifying the [[one]] set of artificial implant model data in response to the motion versus time data generated by the kinematic model simulator ~~dynamic response data~~ indicating that ~~implantation of~~ the artificial implant corresponding to the set of artificial implant model data does not provide the range of motion for joints depicted in the joint motion image data ~~produces a conditional parameter in the kinematic model of the kinematic model simulator~~.

3. (Currently amended) The computer system of claim 2 wherein the implant model generator receives the differential dimensional data from the dynamic response data analyzer and modifies the set of artificial implant model data with ~~incorporates~~ the differential dimensional data to generate a second set of artificial implant model data;

the kinematic model simulator incorporates the second set of artificial implant model data within the kinematic model of the joint to generate a second kinematic model of the joint and simulates movement of the joint with the second kinematic model to generate a

second set of motion versus time data from the simulated movement of the joint with the second kinematic model ~~dynamic response data~~; and

the dynamic response data analyzer determines whether the artificial implant corresponding to the second set of artificial implant model data provides the range of motion for joints depicted in the joint motion image data ~~additional differential dimensional data are generated for modification of the second set of model data~~.

4. (Canceled)

5. (Currently amended) The computer system of claim 1 wherein the anthropometric data analyzer receives computed tomography (CT) data for a plurality of joints for a plurality of subjects for analysis.

6. (Currently amended) The computer system of claim 1 wherein the anthropometric data analyzer receives magnetic resonance image (MRI) data for a plurality of joints for a plurality of subjects for analysis.

7. (Currently amended) The system of claim 1 wherein the anthropometric data analyzer executing on the computer analyzes ~~is a~~ static image data ~~analyzer~~.

8. (Currently amended) The computer system of claim 7 wherein the anthropometric ~~static image~~ data analyzer executes on [[is]] a computer aided design (CAD) system to enable the ~~program that enables an~~ operator to select a feature in the static image data to define ~~for defining~~ a geometric dimension and to measure the selected geometric dimension.

9. (Canceled)

10. (Currently amended) The computer system of claim 1 the system further comprising:

a patient model emulator executing on a computer to generate ~~for generating~~ emulation force parameters that are ~~to be~~ used by the kinematic model simulator to simulate movement of the joint with the kinematic model ~~emulator~~.

11. (Currently amended) The computer system of claim 10 wherein the patient model emulator generates the emulation force parameters from ~~uses~~ image data of a joint in motion ~~to generate the emulation force parameters~~.

12. (Currently amended) The computer system of claim 11 wherein the patient model emulator generates the emulation force parameters from ~~uses~~ fluoroscopic image data of a joint in motion ~~to generate the emulation force parameters~~.

13. (Currently amended) The computer system of claim 12 wherein the kinematic model simulator receives the emulation force parameters generated by the patient model emulator and applies the emulation force parameters to the kinematic ~~an implant~~ model to generate motion versus time data for the simulated movement of the joint with the kinematic model ~~dynamic response data~~.

14. (Currently amended) The computer system of claim 13 wherein the motion ~~dynamic response~~ data analyzer compares the motion versus time data from the simulated movement of the joint with the kinematic model that was ~~dynamic response data~~ generated by the kinematic model simulator to motion versus time data from the fluoroscopic image data used to generate the emulation force parameters ~~to evaluate the set of model data~~.

15. (Canceled)

16. (Currently amended) The computer system of claim 14 wherein the motion ~~dynamic response~~ data analyzer generates a set of differential dimensional data for modification of ~~to alter~~ the set of artificial implant model data.

17. (Canceled)

18. (Currently amended) A method for operating a computer system to generate a set of artificial implant data used to fabricate an ~~designing joint~~ artificial implant that provides a range of motion for joints depicted in joint motion image data ~~components~~ comprising:

displaying joint motion ~~analyzing anthropometric~~ image data for a plurality of joints in a plurality of subjects to enable an operator to identify a plurality of geometric dimensions and a range of values for the identified dimensions;

generating a ~~at least one~~ set of artificial implant model data for fabricating an artificial implant that corresponds to ~~representative of~~ the identified geometric dimensions and a group of values within the range of values for the identified dimensions;

incorporating [[a]] the set of artificial implant model data in a kinematic model ~~simulation~~ of a joint ~~to generate dynamic response data corresponding to the set of implant model~~;

applying emulation force vectors to the kinematic model to simulate movement of the joint and to generate motion versus time data for the simulated movement of the joint with the kinematic model ~~data whereby the dynamic response of an artificial implant corresponding to the set of implant model data may be evaluated; and~~

comparing the motion versus time data generated for the simulated movement of the joint to motion versus time data from the joint motion image data used to identify the geometric dimensions and the range of values for the geometric dimensions that were used to generate the set of artificial implant model data to determine whether the artificial implant corresponding to the set of artificial implant model data provides a range of motion for joints depicted in the joint motion image data; and

storing the ~~dynamic response~~ set of artificial implant model data in a computer memory in response to the determination that the artificial joint corresponding to the artificial implant model data provides the range of motion for joints depicted in the joint motion image data to enable the artificial implant model data to be retrieved for fabricating an artificial implant.

19. (Currently amended) The method of claim 18 further comprising:

generating differential dimensional data to modify ~~for modifying~~ the set of the artificial implant model data in response to the comparison of the motion versus time data from the simulated movement of the joint with the kinematic model ~~dynamic response data~~ indicating that the artificial implant corresponding to the set of artificial implant model data produces motion interference during the simulated movement of the joint with ~~a conditional parameter in~~ the kinematic model; and

modifying the set of artificial implant model data with the generated differential dimensional data to generate a second set of artificial implant model data.

20. (Currently amended) The method of claim 19 further comprising:

incorporating the second set of artificial implant model data in the kinematic model of the joint to generate a second kinematic model of the joint;

applying the emulation force vectors to the second kinematic model to simulate movement of the joint and to generate motion versus time data for the simulated movement of the joint with the second kinematic model;

comparing the motion versus time data generated for the simulated movement of the joint with the second kinematic model to motion versus time data from the joint motion image data used to identify the geometric dimensions and the range of values for the geometric dimensions to determine whether the artificial implant corresponding to the second set of artificial implant model data provides the range of motion for joints depicted in the joint motion image data;

~~determining whether a set of implant model data that generates dynamic response data meets an acceptance parameter;~~ and

storing the second set of artificial implant model data ~~that meets the acceptance parameter~~ in a database file for later use to fabricate an artificial implant in response to the determination that the artificial joint corresponding to the second set of artificial implant model data provides the range of motion for joints depicted in the joint motion image data to enable the artificial implant model data to be retrieved for fabricating an artificial implant.

21. (Currently amended) The method of claim 18 wherein the display of joint motion ~~anthropometric~~ data ~~analysis~~ includes display ~~analysis~~ of computed tomography (CT) data for a plurality of joints in a plurality of subjects.

22. (Currently amended) The method of claim 18 wherein the display of joint motion ~~anthropometric~~ data ~~analysis~~ includes display ~~analysis~~ of magnetic resonance image (MRI) data for a plurality of joints in a plurality of subjects.

23. (Currently amended) The method of claim 18 wherein the display of joint motion ~~anthropometric~~ data ~~analysis~~ includes display ~~analysis~~ of three dimensional image data for a plurality of joints in a plurality of subjects.

24. (Currently amended) The method of claim 18 wherein the display of the joint motion image data ~~analysis~~ includes enabling an operator to select a feature in static image data to define ~~for defining~~ a geometric dimension and to measure ~~measuring~~ the selected geometric dimension.

Claims 25-26 (Canceled).

27. (Currently amended) The method of claim 26 wherein the artificial implant model data modification includes modification of the set of artificial implant model data using fluoroscopic ~~dynamic motion~~ image data of a plurality of joints in motion from a plurality of subjects ~~joint compiled by taking fluoroscopic images of a joint in motion~~.

28. (Currently amended) The method of claim 18 ~~wherein the~~ further comprising:

generating the ~~kinematic model simulation includes applying~~ emulation force vectors from image data of a joint in motion ~~to the implant model data~~.

29. (Canceled)

30. (Currently amended) The method of claim 28 wherein the comparison of the motion versus time data generated for the simulated movement of the joint to the motion versus time data from the joint motion image data ~~dynamic response data analysis~~ includes identifying motion interference with the motion versus time data comparison ~~a conditional parameter~~.

31. (Currently amended) The method of claim [[29]] 30 wherein the ~~dynamic response data analysis~~ comparison of the motion versus time data generated for the simulated movement of the joint to the motion versus time data from the joint motion image data includes generating a set of differential dimensional data for modification of ~~from the identified conditional parameter to alter~~ the set of artificial implant model data to reduce a ~~so that the~~ likelihood of motion interference ~~the conditional parameter~~ occurring from an implantation of [[an]] the artificial joint corresponding to the set of artificial implant model data ~~is reduced~~.

32. (Currently amended) A computer system that generates a set of artificial implant data used to fabricate an artificial implant that provides a range of motion for joints depicted in joint motion image data ~~for developing solid model data from joint motion image data~~ comprising:

a motion data analyzer executing on a computer coupled to an interface for receiving ~~analyzing~~ joint motion image data for a plurality of joints ~~to group image~~ in a plurality of subjects, the motion data analyzer grouping the joint motion image data into sets that are correlated by a range of motion for a particular activity for joints depicted in the joint motion image data ~~studies according to range of motion and activity~~;

an anthropometric data analyzer executing on a computer, the computer executing the anthropometric data analyzer being coupled to the computer executing the motion data analyzer to display one of the sets of joint motion image data correlated by the range of motion for a particular activity to enable an operator to select ~~for generating~~ geometric dimensions and measurement ranges for the geometric dimensions from the one set of joint motion image data~~, the geometric dimensions and measurement ranges corresponding to image data in at least one group of image studies~~;

an artificial implant model generator executing on a computer that is coupled to the computer executing the anthropometric data analyzer to generate ~~for generating an~~ artificial implant model data from the geometric dimensions and the measurement ranges received from the anthropometric data analyzer;

a kinematic model simulator executing on a computer that is coupled to the computer executing the artificial implant model generator, the kinematic model simulator simulating movement of a joint with the artificial implant model data received from the computer executing the artificial implant model generator and generating motion versus time data from the simulated movement of the joint ~~dynamic response data corresponding to images of a simulation generated by the kinematic model simulator that are displayed by the kinematic model simulator; and~~

the motion data analyzer comparing the motion versus time data generated by the kinematic model simulator with motion versus time data from the one set of joint motion image data used to identify the geometric dimensions and the range of values for the geometric dimensions that were used to generate the set of artificial implant model data to determine whether the artificial implant corresponding to the set of artificial implant model data provides the range of motion for a particular activity for joints depicted in the one set of joint motion image data; and

a database coupled to the computer executing the kinematic model simulator, the database receiving and storing ~~for storage of~~ the artificial implant model data in response to the comparison of the motion versus time data indicating the artificial implant model data provides the range of motion for a particular activity for joints depicted in the joint motion image data ~~dynamic response data~~.

33. (Currently amended) The computer system of claim 32 wherein the computer executing the motion data analyzer receives fluoroscopic image data of a plurality of joints in motion through the interface from a database in which fluoroscopic image data are stored.

Claims 34-36 (Canceled).

37. (Currently amended) The computer system of claim [[36]] 33 further comprising:

~~wherein~~ a dynamic response data analyzer executing on a computer that receives the motion versus time data from the kinematic model simulator and generates differential dimensional data for modifying the artificial implant model data in response to the comparison of the motion versus time data from the simulated movement of the joint to the motion versus time data from the one set of joint motion image data indicating that the artificial implant corresponding to the artificial implant model data does not provide the range of motion for a particular activity for joints depicted in the one set of joint motion image data

~~the motion data analyzer generates a set of differential data in response to the comparison indicating that the artificial implant model was unable to achieve normal joint motion~~.

38. (Currently amended) A method for ~~developing solid model data from~~ operating a computer system to generate an artificial implant design corresponding to a set of artificial implant data that is used to fabricate an ~~designing joint~~ artificial implant that provides a range of motion for an activity depicted in joint motion image data comprising:

executing a program on a computer to analyze ~~analyzing~~ joint motion image data for a plurality of joints in a plurality of subjects ~~groups~~ to group the joint motion image data into sets, each set corresponding ~~studies according~~ to a range of motion for an ~~and~~ activity;

executing a program on a computer to display one of the sets of the joint motion image data to enable an operator to select ~~generating~~ geometric dimensions and measurement ranges for the geometric dimensions, the geometric dimensions and measurement ranges corresponding to the joint motion image data ~~studies~~ in the ~~at least~~ one set ~~group~~ of joint motion image data ~~studies~~;

executing a program on a computer to generate ~~generating~~ [[an]] a set of artificial implant model data from the geometric dimensions and measurement ranges;

executing a program on a computer to incorporate ~~simulating~~ the set of artificial implant model data into a kinematic model of a joint ~~using the generated artificial implant model~~;

executing a program on a computer to generate motion versus time data from a simulation of joint movement with the kinematic model of the joint;

executing a program on a computer to compare the generated motion versus time data to motion versus time data for a range of motion for an activity depicted in the joint motion image data used to generate the set of artificial implant model data; and

executing a program on a computer to store the set of artificial implant model data in a database for later retrieval and use in fabrication of an artificial joint in response to the motion versus time data generated for the simulated joint movement corresponding to the range of motion for an activity depicted in the joint motion image data.

39. (Currently amended) The method of claim 38 wherein the analysis of the joint motion image data performed by the computer executing the program for joint motion image data analysis includes receiving fluoroscopic image data of a plurality of joints in motion for a plurality of subjects.

40. (Canceled).

41. (Currently amended) The method of claim [[40]] 38 wherein the analysis of the joint motion image ~~anthropometric~~ data performed by the computer executing the program for joint motion image data analysis includes:

determining whether one or more geometric dimension groupings correlate to at least one joint ~~the joints~~ depicted in the image data in the one set of joint motion image data ~~studies associated with a motion grouping~~.

42. (Currently amended) The method of claim 41 wherein the analysis of joint motion image data performed by the computer executing the program for joint motion image data analysis includes:

comparing the motion versus time ~~response~~ data generated ~~received~~ from the simulation of joint movement with the kinematic model ~~simulator~~ with [[the]] motion versus time data from the ~~at least~~ one set of [[the]] joint motion image data ~~studies correlated to the motion grouping that was used to develop the artificial implant model~~.

43. (Currently amended) The method of claim 42 wherein the analysis of the joint motion image data performed by the computer executing the program for joint motion image data analysis includes:

generating a set of differential dimensional data in response to the comparison indicating that the artificial implant model did not correspond to the range of motion for an activity depicted in the one set of joint motion image data ~~was unable to achieve normal joint motion~~.

44 (Canceled).